

Egyptian Architecture

- 1) Outline arch. character of Great Pyramid of Cheops.
- 2) Classify temple arch. in Ancient Egypt.
Illustrate the same with eg.
- 3) Evolution of pyramids from mastabas.
- 4) What were the two cultural determinants in ancient Egypt? How did it dictate the lifestyle & beliefs of ancient Egyptians for the 3000 years of its civilisation?
- 5) Describe tomb arch in Egypt.
- 6) Explain with eg. characteristics of rock cut temple in Egypt.

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CLASSIFICATION

1. Landscape & Culture.
2. History.
3. Religion.
4. Monumentality.
5. Tomb architecture — evolution of pyramid from mastaba
6. Temple " — mortuary & rock-cut.

CASE STUDY:

1. Great Pyramid of Cheops, Giza.
2. Temple of Ammon Ra, Karnak.
3. Temple of Abu Simbel.

HISTORY OF ARCHITECTURE AND CULTURE I

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25/09/2012

12/09/2012

CLASS 03

Ancient River Valley Civilisation

EGYPT

PART I

Landscape and culture of Ancient Egypt
History
Religious and funerary beliefs and practices
Monumentality

PART II

Tomb Architecture: Evolution of the Pyramids from Mastabas
Temple Architecture: Mortuary temples and Cult temples
Great Pyramid of Cheops
Temple of Ammon Ra, Karnak
Temple of Abu Simbel (Rock cut)

WHAT IS A CIVILISATION?

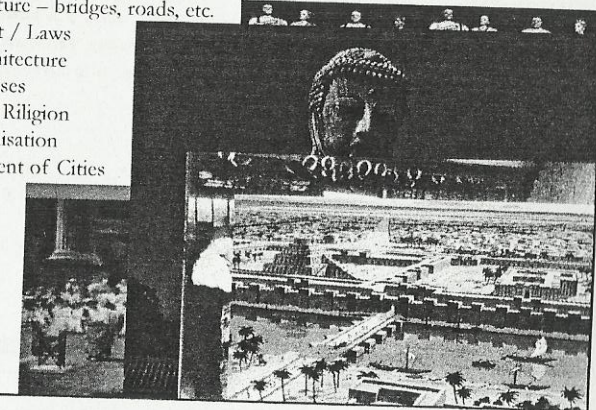
It simply means: the comprehensive development of the human potential in all its dimensions: physical, intellectual, spiritual, moral and psychological.

To achieve this potential, civilisations strive to develop, utilize, and conserve the natural resources, the benefits of which should fairly reach the *whole society*, and bring about *positive effects* on the *whole world*.

- Group of *people living and working together* for the purpose of creating an *organized society*.
- the highest *cultural grouping* of people which distinguishes humans from other species
- *complex systems or network* of cities that emerge from pre-urban culture

BASIC FEATURES OF A CIVILISATION

Writing Systems
Infrastructure – bridges, roads, etc.
Government / Laws
Art / Architecture
Social Classes
Organised Religion
Job Specialisation
Development of Cities



Hieroglyphics,

Pyramids,

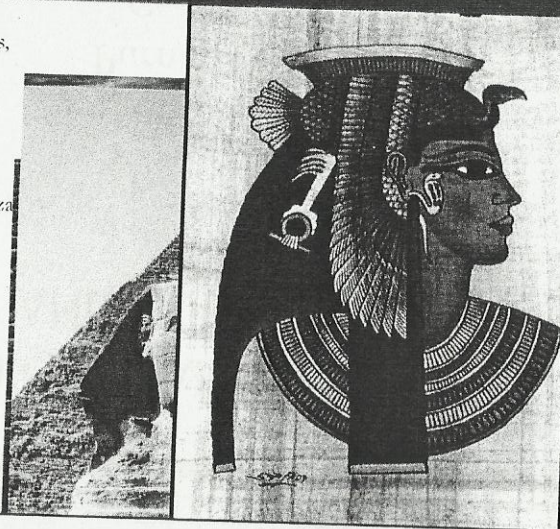
Mummies,

Sphinx of Giza

King Tut,

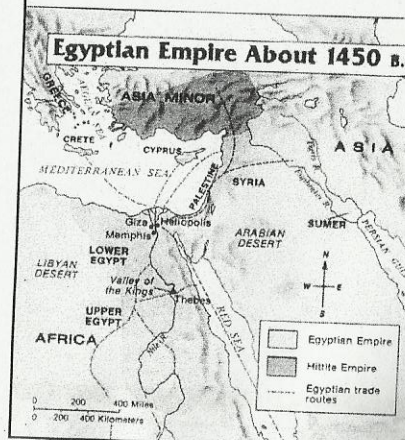
and..

Cleopatra.

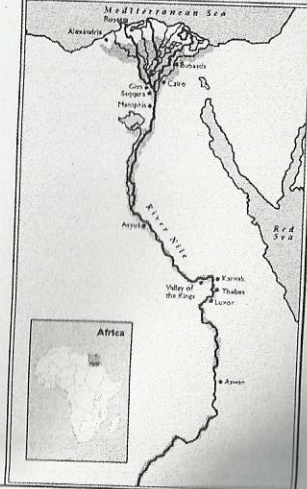


THE NILE..

Egyptian Empire About 1450 B.C.



MAP OF EGYPT WITH THE RIVER NILE



Egyptians artisans - smelted copper and gold for artistic, architectural, and even military purposes.



The Book of the Dead was written using special cursive pictograms that link hieroglyphics to the hieratic form used in later Egyptian religious writings.



Pharaohs and the Legacy of Ancient Egypt...

A BRIEF TIMELINE OF ANCIENT EGYPT

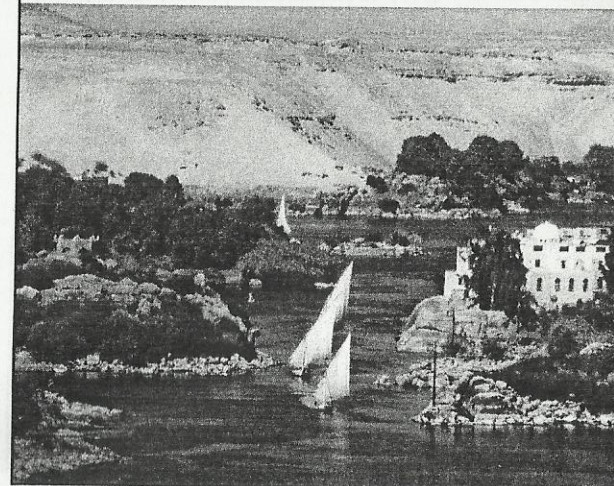
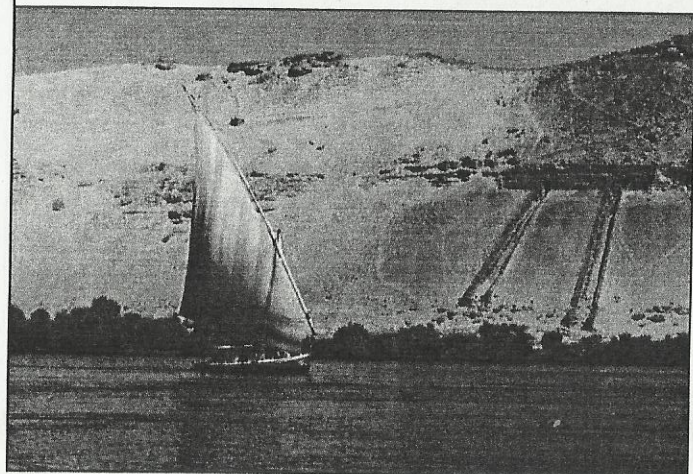
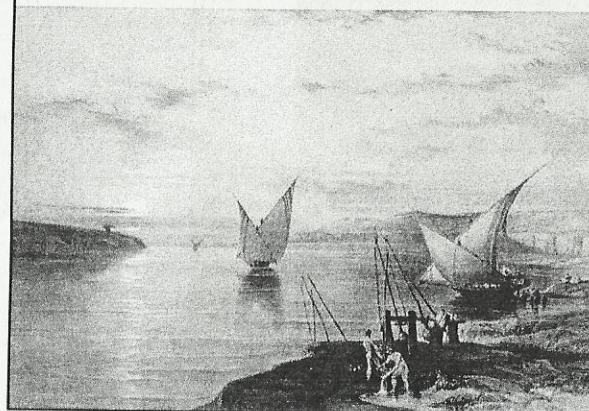
Ancient Egypt's great civilisation spanned thousands of years, from c.3000 B. C. until the annexation by Rome in 30 B. C.

DATE (B.C.E.)	EVENT
6000	First inhabitants settle along the Nile Delta.
2900	King Menes unites Upper and Lower Egypt.
2772	365-day calendar is invented.
2750	The Old Kingdom is established with its capital in Memphis.
2560	King Khufu (Cheops) builds the Great Pyramids of Giza.
2181	Instability and corruption weaken the empire.
2050	The Middle Kingdom is established and the capital moves to Thebes.
1750	The Hyksos, a group of Semitic-Asiatics, invade and rule Egypt.
1550	The Hyksos are expelled and the New Kingdom established.
1500	Queen Hatshepsut expands the empire south (Nubia) and east (Palestine).
1380	Amenhotep IV ("Akhenaton") supports worship of only one god, the sun-disk god Aton.
1336	Tutankhamun ("King Tut") revives polytheism and returns to the capital to Thebes.

1290	Ramses II ("The Great") begins a 67-year reign and completes Temple of Luxor.
1283	Egyptians and Hittites sign the first recorded peace treaty.
712	Egypt is invaded from the south by the Nubian Empire, which starts an "Ethiopian Dynasty."
670	Assyrians conquer Egypt.
525	The Persian Empire conquers Egypt.
343	Nectanebo II, the last Egyptian-born pharaoh, dies.
332	Alexander the Great of Macedonia invades Egypt.
331	The city of Alexandria is established and the Macedonian general Ptolemy begins new dynasty.
51	The Ptolemaic queen Cleopatra VII rules Egypt, assisted by Julius Caesar.
30	Cleopatra commits suicide, and Egypt is annexed by the Roman Empire.

Life along the Nile

The Nile — the longest river in the world at 4,187 miles — defines Egypt's landscape and culture. A common Egyptian blessing is "*May you always drink from the Nile.*"



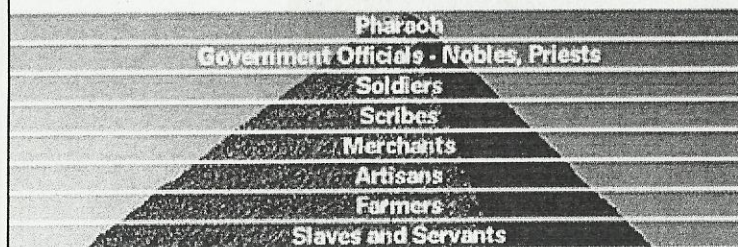
The ancient Egyptian writing system, hieroglyphics, was advanced by 3100 B.C.E.

The complex system included numbers and an alphabet as well as other symbols.



Egyptian Social Structure

In the social pyramid of ancient Egypt the pharaoh and those associated with divinity were at the top, and servants and slaves made up the bottom.



The Chain of Command..

Ancient Egyptian royalty, nobility, and clergy enjoyed lives of wealth and comfort while farmers and slaves struggled to subsist.



Noble Aims

Religion was a central theme in ancient Egyptian culture and each town had its own deity.

Initially, these deities were animals; later, they took on human appearances and behaviors.

Seated here is *Thoth*, the god of learning and wisdom, carrying a scepter symbolizing magical power.



Soldier On

The Earliest Dynasties

All pharaohs wore beards — even female rulers...

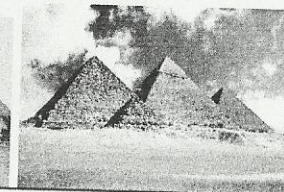
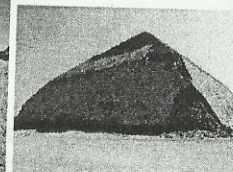
...as shown by this bust of **Hatshepsut**.



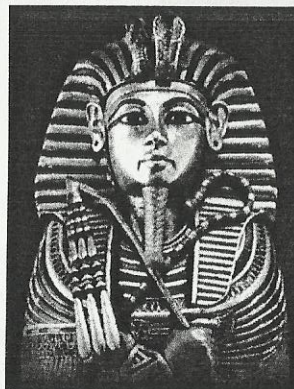
The Earliest Dynasties

The step pyramid of Netjerikhet in Saqqara (left) believed to have been the first pyramid constructed in Egypt, was *completed in the 27th century B.C.E. during the Third Dynasty.*

Pyramid building progressed through the dynasties, culminating in the Pyramids of Giza (right).



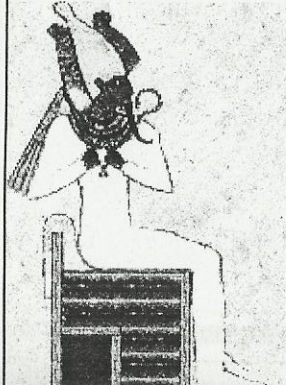
Tutankhamun may be the most famous of Egypt's pharaohs because of the discovery of his untouched tomb in 1922. The tombs of more prominent pharaohs had been pillaged, but Tut's resting place and its golden treasures had escaped the hands of looters.



Mummies

Legend claims that Osiris taught agriculture to the ancient Egyptians.

After being murdered by his brother Seth, Osiris became even more influential as ruler over both the dead and the underworld.



This is an example of an **Egyptian coffin** made of wood, painted, then gilded.

Created during the Ptolemaic Period (305-30 B.C.E.), the lid is adorned with images from the *Book of the Dead*, a text believed to lead the dead into the lands of Osiris, the god of the underworld.

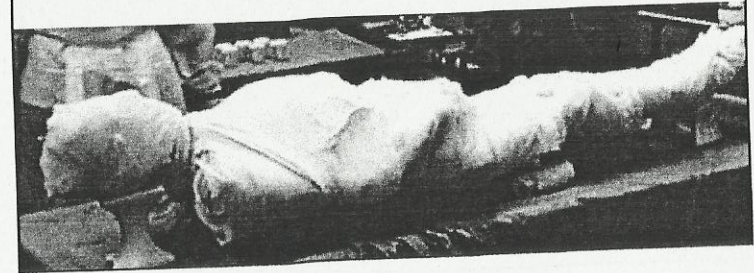


Mummification..

1. Removal of the Brain.
2. Organ Removal (Evisceration)
3. Dehydration with Natron Crystals
4. Stuffing
5. Oiling the Body
6. Colouring
7. Arrangement of the Body
8. Wrapping
9. Funerary Mask
10. Burial of Waste

Meet Mumab, the *first mummy* created in nearly 2,000 years using the ancient Egyptian formula.

Before his mummification, *Mumab* lived in Baltimore, Maryland.



Women of Ancient Egypt

THANK YOU..

purnima gopalakrishnan

TOMB ARCHITECTURE

Egypt's pyramids served as tombs for her dead kings.

The focus of a complex of ritual buildings, the pyramid was the magical powerhouse where the mummified pharaoh would attain eternal life.

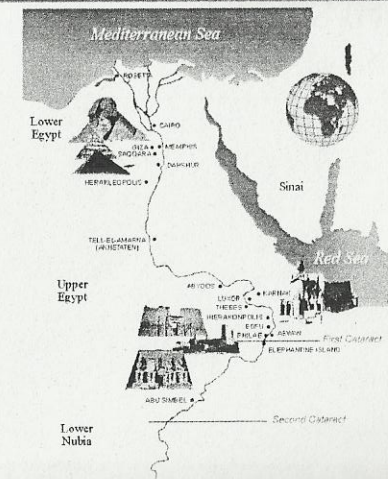
The first pyramid was Djoser's Step Pyramid, built not long after Egypt had become a unified land (in approximately 3000 BC).

The Great Pyramid of Khufu, at Giza, was raised a century later.

But these pyramids did not come from a technological void.

A clear evolution can be traced from the most ancient prehistoric graves to the splendours of the Giza plateau.

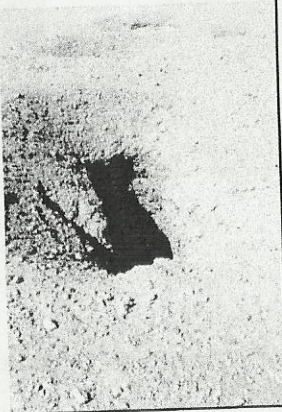
Evolution of the Pyramids



Prehistoric pit graves

At the dawn of the dynastic age, around the time of unification, Egypt's dead were buried in oval pit graves in desert cemeteries.

Here the bodies underwent a natural mummification as the hot sands drained away the body fluids, averting the onset of decay.



Already there was a belief in life after death, and the dead were provided with grave goods.

Eventually the elite started to protect the bodies of their dead with wooden and clay coffins, and sarcophagi (outer coffins).

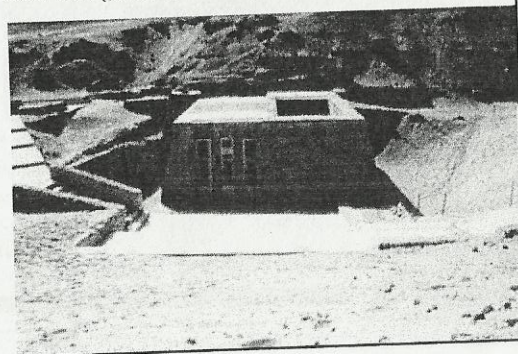
The pit graves were given wooden roofs and plaster or mud-brick linings and they became rectangular, sand-free tombs.

Above ground a superstructure, perhaps a pile of stones or a low mound, marked the position of the grave.

These flimsy superstructures have today vanished, although what lay below has sometimes remained.

Mastaba tomb, Saqqara

Egypt's highest ranking Old Kingdom civil servants were interred at Saqqara, close to Memphis and the temple of Re at Heliopolis. Here the burial chambers were gradually cut deeper until they passed into the bedrock.



Lined with wood, their ceilings were topped with a low mound and then surrounded by a low, rectangular mud-brick building known as a **mastaba** after the Arabic mastaba (low bench).

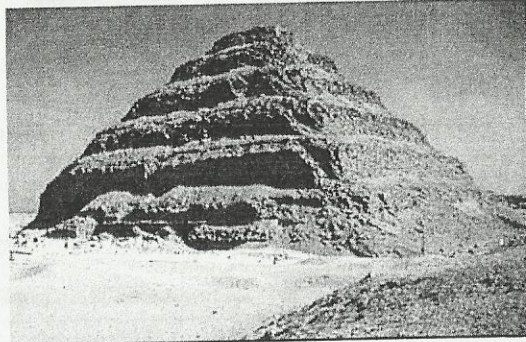
Most mastaba superstructures were filled with storage chambers for grave goods, but this made them vulnerable to thieves.

By the end of the 1st Dynasty the superstructure was being reduced in favour of extensive subterranean storage, reached by a stairway.

Eventually the mastaba would become a solid, rubble-filled block.

Djoser's Step Pyramid

Djoser's pyramid has a stepped appearance. It is an extension of the mound found in mastaba tombs and is usually interpreted as a symbolic mound of creation, but can also be read as a stairway to heaven.



Djoser's architect, Imhotep, built in stages.

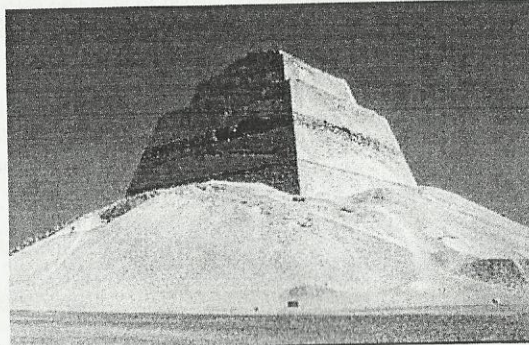
The tomb started life as an unusual square, solid mastaba, but a series of extensions saw it develop into a six-stepped pyramid with a rectangular ground-plan.

Below ground, a warren of tunnels, galleries and rooms surrounded Djoser's burial chamber.

Around the pyramid, his mortuary complex included courts and buildings, each with its own particular function, and its own particular characters.

Meidum Pyramid

At Meidum, 30 miles south of Memphis, King Snefru (the first king of the 4th Dynasty, who came to the throne around 2613 BC) built Egypt's first true, or straight-sided, pyramid.



This started as a stepped pyramid, but as it neared completion the steps were packed with stone and the whole structure was cased in finest limestone.

In its final form the pyramid stood approximately 311ft (95m) high.

Unfortunately the pyramid was unsound. Its heavy outer layers eventually slid downwards, leaving a square, three-stepped core standing in a mountain of sand and rubble and the ruins of the pyramid complex.

We do not know when this disaster occurred, although as there are New Kingdom tombs incorporated in the rubble we know that the pyramid had at least partially collapsed by the time of the New Kingdom (which started around 1550 BC).

Bent Pyramid of Dahshur

Snefru built two pyramids at Dahshur. His first was designed from the start as a true pyramid. But the 54 degrees angle proved too steep, and as the pyramid was being built on soft, silty clay, there was a problem with stability and subsidence.



This was solved by adjusting the pyramid angle to a flatter 43 degrees, 147ft (45m) up the face.

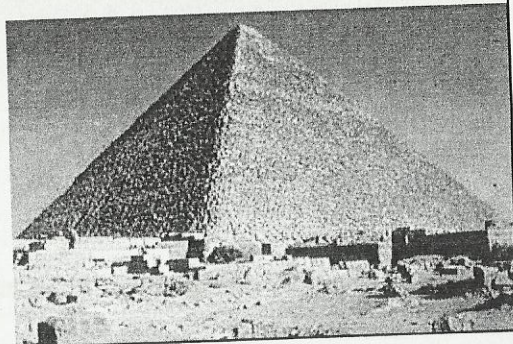
The reduced angle brought increased stability, but led to the pyramid's modern name, the Bent Pyramid.

Snefru's second Dahshur pyramid, the Red Pyramid, was a successful true pyramid.

It seems that this must have served as the king's eventual resting place.

The Great Pyramid

Khufu, or Cheops, built his pyramid on the Giza plateau, where he found firm bedrock and a convenient limestone quarry. His pyramid is a work of astonishing size and precision, standing **481ft (146.6m)** high, with a slope of **51 degrees 50'**.



Its sides vary by less than **1.9ft (58cm)** and are orientated almost **exactly true north**.

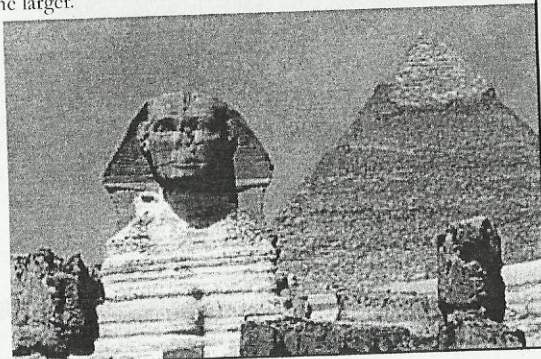
Its base is almost completely level.

It has been calculated that the base of the Great Pyramid could accommodate both the UK Houses of Parliament and St Paul's Cathedral with room to spare.

The pyramid holds **three chambers** linked by a system of passageways: the unfinished '**Subterranean Chamber**'; the ill-named '**Queen's Chamber**'; and the '**King's Chamber**', where Khufu was buried in an enormous, plain, red granite sarcophagus.

Khafre's pyramid and Sphinx

Khafre, Khufu's son, built beside his father's pyramid. His is the smaller pyramid, but as it is built on higher ground, and has a slightly steeper angle, it appears the larger.



Today Khafre's complex is the most complete of the Giza three, while his is the only pyramid to retain some of its upper casing stones.

The **Great Sphinx** crouches beside Khafre's Valley Temple.

This fabulous beast consists of the king's head, 22 times life-sized, perched on a massive lion's body.

It is **236ft (72m)** long and **65ft (19.8m)** tall, making it Egypt's largest statue.

As it is carved from a naturally occurring rocky outcrop, covered in places with a stone block veneer, the Sphinx shows differential weathering due to the three limestone strata included in its body.

New Kingdom pyramid, Deir el-Medina

The arrival of the 18th-Dynasty Theban kings at the start of the New Kingdom heralded the end of royal pyramid building in Egypt. Henceforth, most pharaohs would be buried in secrecy in the Valley of the Kings.



Now individuals felt free to include the pyramid form in their own tombs.

Small-scale pyramids are found from Saqqara to Nubia, but the best known examples are those built by the workmen and officials of Deir el-Medina, the village of the royal workforce employed in the Valley of the Kings.

Outside the village wall the hill-side displayed ranks of mud-brick pyramids, some of which still stand, combined with decorated rock-cut burial chambers.

The pyramids frequently included a niche designed to house a stela (a kind of tombstone) or statue.

TEMPLE ARCHITECTURE

This moment was called the **First Occasion**.

As sentient beings, the Egyptians reciprocated by building temples to revere and nourish the gods.

The Design of the first temple was laid down by the gods and each successive temple was a copy of the first one.

The design encouraged the gods to bring divine energy into the earth's plane.

Priests worked at temples, conducting the daily rituals in honour of the deities and pharaohs to whom the temples were dedicated.

Over a long period of time, the Egyptians built temples along the Nile.

These impressive structures, with their huge columned halls and Pylon Gateways, were built to honour the dead and venerate local and national gods.

Temples were places where The Gods and their divine energy could reside, separated from everything else in the world.

According to the Egyptian creation legend, the first temple came into existence on a **mound** of land that rose up from the primeval sea, called **Nun**.

The first form of life to appear on that mound was a plant on which the falcon, **Horus**, first perched.

Another version of the story describes the Lotus flower as the first plant on which the sun emerged. Following this, human beings were created.

Types of Temples

There are two types of temples which were built in Ancient Egypt.

The first, **Cult Temples**, were dedicated to the worship of a specific god of Egypt.

An example of the Cult Temple is the Temple of **Horus at Edfu** or **Temple of Isis at Aswan**.

The second type, **Mortuary temples**, were built to honor a deceased pharaoh and often worship them as a god.

An example of the Mortuary temple is the **Temple of Ramesse II at Thebes**.

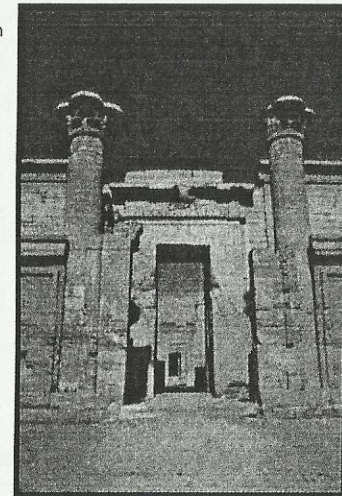
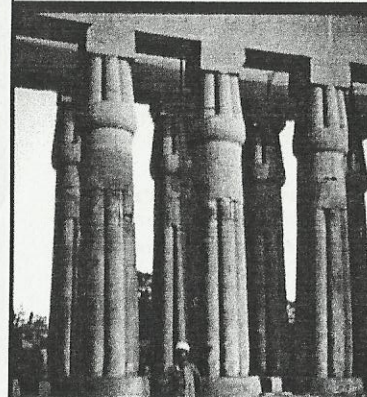
Temples in Egypt were a reflection of the Egyptians mythology of the "Island of Creation."

The pillars were often shaped in the designs of palms, papyrus, and lotus which were plants believed to be on the island.

All major creation myths put the origins at the "Island of Creation" and the religion emphasis on the idea of trying to return to that time

The Palm column

The lotus column



At the Cult temples, there were two types of ceremonies to the gods.

The first was a **daily ceremony** of giving offerings and providing for the needs of the gods.

The offering was usually performed by the priest in the sanctuary of the temple.

Ordinary people, it is believed, were not allowed into the sanctuary of the temple and would have to stay outside.

The second type of ceremonies were **special festivals**.

These would happen at different times of the year.

It was at those times that ordinary Egyptians could participate to a degree in the worship of the god.

The Egyptians placed a very high value on the temples in Egypt.

The people looked to the pharaoh and the priest to intercede on their behalf to the gods.

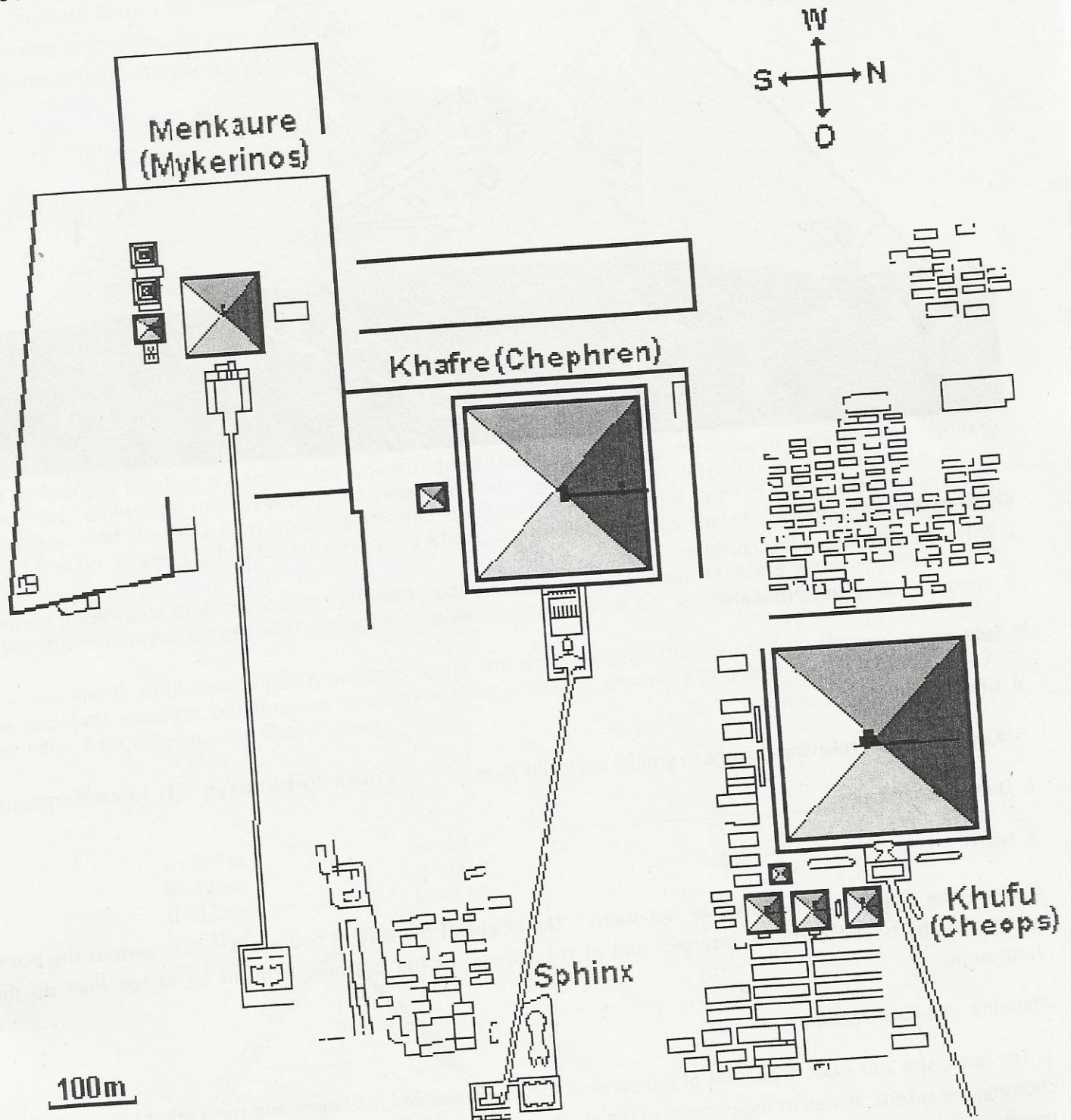
The temple was believed to be the physical location where the Egyptian could connect with the gods.

The Great Pyramid of Khufu (Cheops)

Khufu's pyramid is not only the largest pyramid ever built, but it also has the most complicated inner structures of all pyramids.

Overview Giza plateau

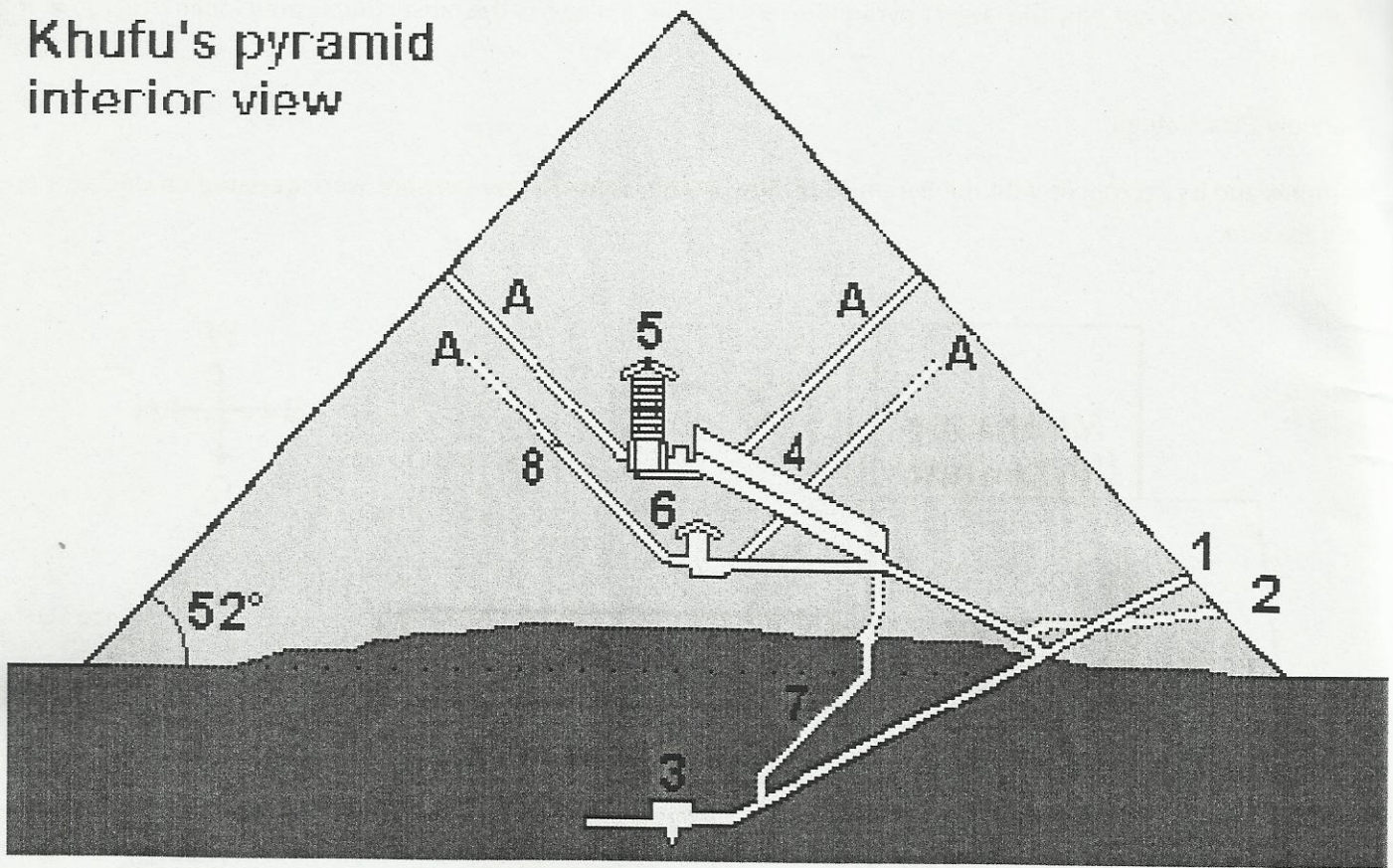
Memphis and its necropolis with the Pyramids of Giza, Abusir, Saqqara und Dahshur were declared an Unesco World Heritage Site.



The Giza Plateau (Gizeh, Ghizeh, or Geezeh in Arab Al-Gîza) with Khufu's, Khafre's and Menkaure's pyramids

Overview Khufu's pyramid

Khufu's pyramid interior view



Khufu-Pyramid

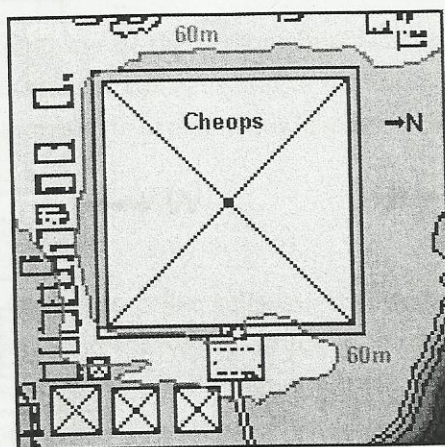
1. Entrance with descending corridor
2. Entrance cut by grave robbers
3. Subterranean chamber
4. Grand Gallery
5. King's chamber, relieving chambers, granite portcullis slabs
6. Queen's chamber
7. Shaft
8. Limestone plugging the air shaft A= "Air shafts". The height of the core of bedrock is only known at the places where the shafts and corridors intersect and at the corners of the pyramid. It might be higher than on this illustration.

Planning and Construction

1. The form, size and exact alignment of the pyramid had to be planned, its height and the angle of inclination (by choosing the seked), as well as the position of the shafts and chambers inside the pyramid were determined and the temple and the causeway planned.

2. It was very important, to choose the right building ground. Major problems had developed while building other pyramids because the ground was too soft and yielded, and some projects had to be altered considerably or even failed. The Giza plateau is very stable ground, mostly bedrock which consist of nummulite limestone from the so called Mokattam formation [1]. A disadvantage is, that digging shafts and chambers in this kind of hard stone is much more difficult.

3. Secondly, it was important to choose a place as close as possible to the harbor of the Nile channel and to the quarries on the Giza plateau. The pyramid of Khufu (Cheops-pyramid) was probably built in the northeast of the Giza plateau, because there was a large rock outcropping over which the pyramid could be built. We don't know how large the rock core under the pyramid is, the precise height is only known, where it can be seen at the corners of the pyramid and in the shafts (Illustration = orange).

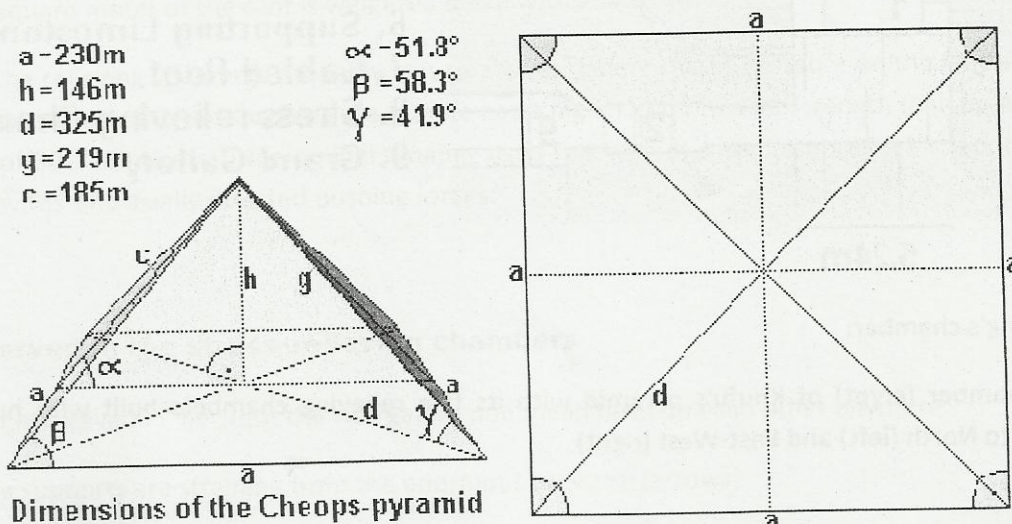


The builders of Khufu's pyramid took advantage of the rock outcropping to both increase the stability of its core, as well as to conserve the amount of building materials needed for its construction. Some speculate, that the rock core might reach nearly up to underneath the floor of the queens chamber, which lies on 20 m [1], but for sure we only know, that it reaches 7.9 meters at one of the shafts [3].

Khufu's pyramid is built on a slightly sloping base. Actually the ancient builders were required to cut down the northwest corner of the platform, while the southwest corner had to be built up.

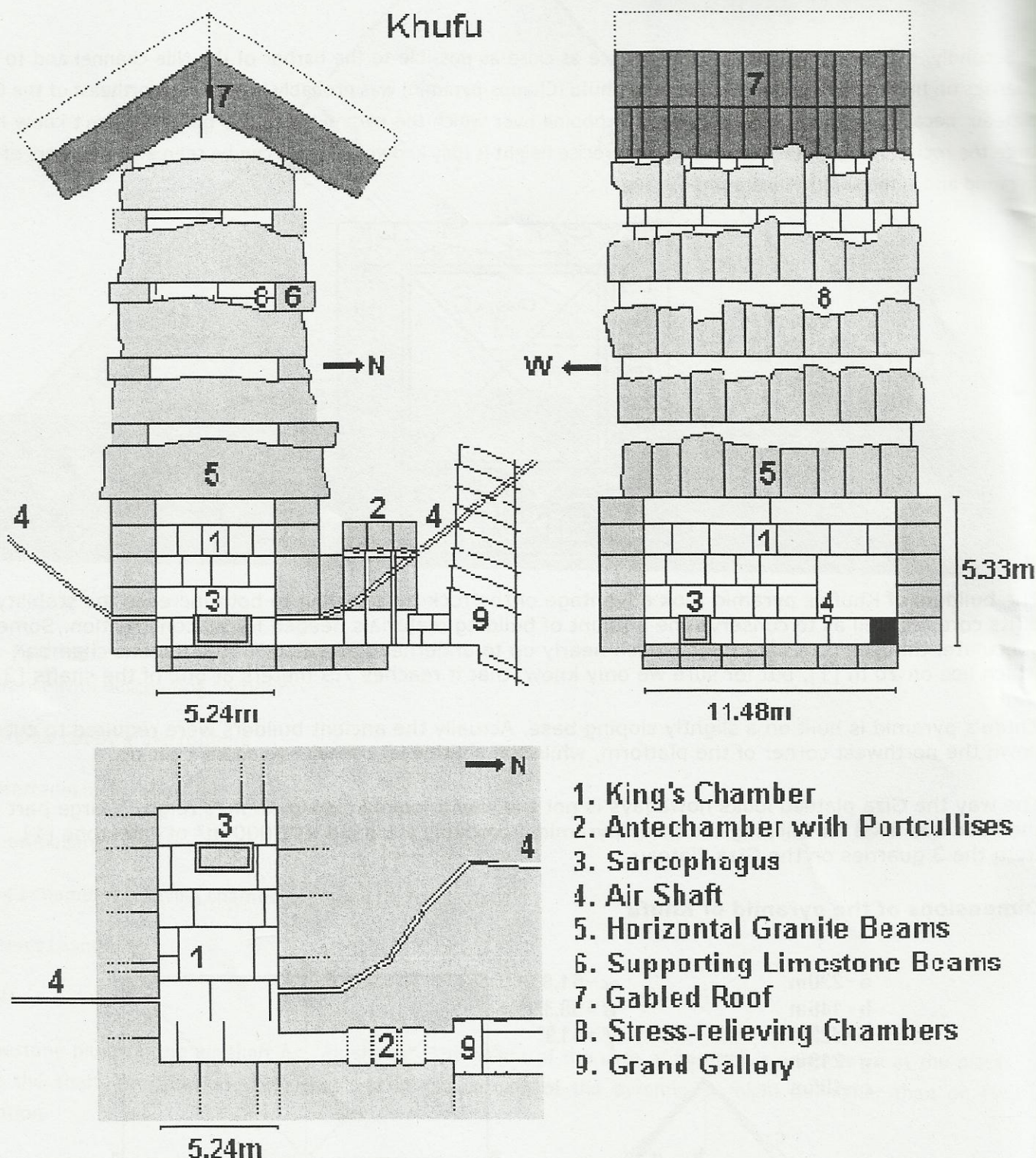
The way the Giza plateau looks nowadays is not the way it looked during Khufu's reign. A large part of the rock was used for building the three pyramids, probably around 4'700'000 m³ of limestone [1] from the 3 quarries on the Giza Plateau.

Dimensions of the pyramid of Khufu



The King's chamber

The King's chamber lies on 43.03m [1] and is lined with granite. On top of the chamber are five so called relieving chambers (see below). A granite sarcophagus lies in the chamber, but it is not known if there ever was a corpse put to rest there; a mummy or grave goods haven't been found inside the pyramid.



Plan of the King's chamber:

The King's Chamber (crypt) of Khufu's pyramid with its five relieving chambers built with huge granite stone blocks. South to North (left) and East-West (right)

Dimensions of the King's chamber:

The chamber which is completely enclosed inside the pyramid structure was right-angled

The ancient Egyptians didn't know the theory explaining the Pythagorean theorem ($a^2 + b^2 = c^2$) but they knew from experience, that they could form right angles by using a so called primitive Pythagorean triple (for example $3^2 + 4^2 = 5^2$). As the King's chamber shows, they used this knowledge expertly when building.

The sarcophagus:

The base of the granite sarcophagus, lying in the King's chamber of Khufu's pyramid measures $98,7 \times 105,1 \times 227,6\text{cm}$ [1], there is no lid. Because of its size the sarcophagus must have been transported there already while the construction of the King's chamber was taking place, it would not have been possible to haul it through the passages, the Grand Gallery and specially past the low entrance into the chamber later.

According to some Egyptologists [7] the inside of the sarcophagus was hollowed out using a bow drill and copper bits. To chisel the precise corners inside the sarcophagus and to make reliefs they suggest that chisels and scrapers made from stone were used, not metal tools. The sarcophagus is made from hard granite, so how could it have been hollowed out using only copper tools?

The Chambers:

The largest granite beams were used for the so called relieving chambers. The beams are about 2m thick and 8m long, between them lie limestone beams and the whole structure is covered with a gabled roof also made from limestone. Here the largest granite beams were used, they weight from 40 to 50 tons and had to be brought to a height of 43 to 65 meters (= tip of the gable). The lifting of these beams is challenging but not a insurmountable problem, if you use Franz Löhner's heavy duty track system.

We only know about the stress-relieving chambers because in 1837 Howard Vyse had small tunnels dug and blasted, but we don't know about what lies on top of the gable. If you compare the configuration of the King's chamber with the way the entrance to the pyramid was built you notice, that two layers of stone blocks were used there to form a double gabled roof. For this reason some archeologists conjecture, that there might be another layer of limestone slabs lying on top forming a double gabled roof.

Why build these chambers?

The King's chamber is a hollow space in the middle of a massive structure of stone. The chamber itself is a hard granite nucleus surrounded by softer limestone. On the roof beams which lie on 48 meters, another 98 meters of stone press down - that weight is enormous! One cubic meter of limestone weights 2.6 tons (density 2600 - 2900 kg/m^3), so each square meter of the roof is weighted down with 254.8 tons!

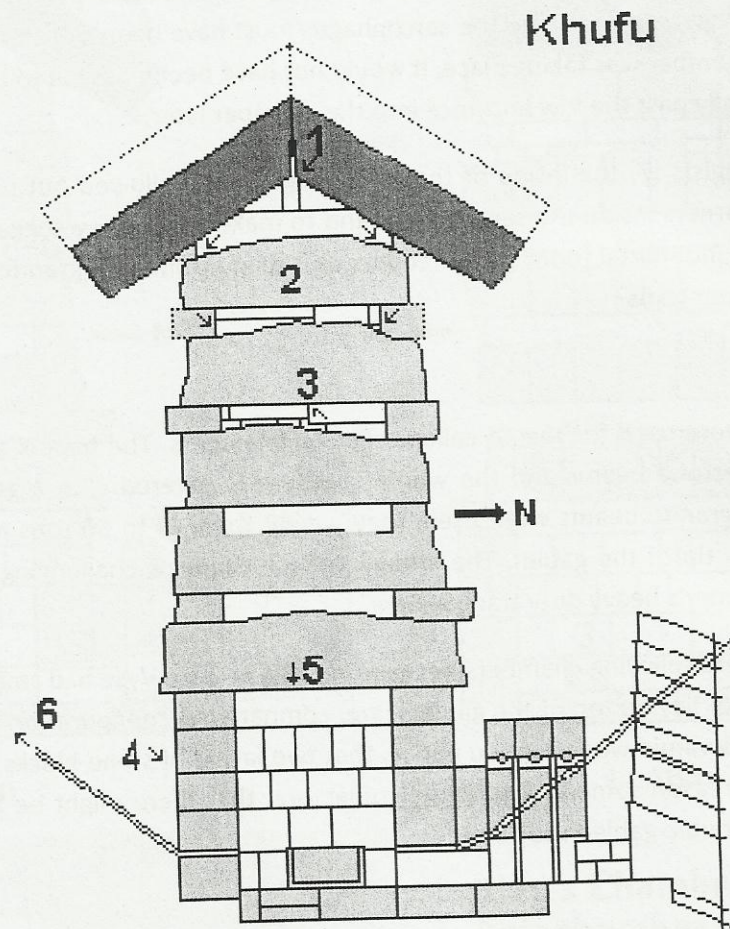
The purpose of the relieving chambers probably was to absorb the enormous pressure on the King's chamber and to redirect it into the surrounding stones. Because granite has a higher compressive strength than limestone (160 - 240 N/mm^2 instead of 80 - 180 N/mm^2) the builders mainly used this type of rock. Compressive strength is the capacity of a material to withstand axially directed pushing forces.

Damage observed in the stress-relieving chambers

1. The roof is slightly caved in, because the two gables don't lean flush on each other anymore
2. The limestone supports are straining from the enormous pressure (arrows)
3. The original plaster bond between the upper western granite beams and the western wall has moved by 15cm

4. Because 98 meters of stone press on the hard granite chamber, the softer limestone around it shifted and lowered by 15cm. The southern wall was injured and the chamber warped. The first and fifth stone course subsided and from the eastern corner a long fissure is running through several stones [3].
5. The roof beams are contorted by 4 cm and the second, third and forth beam have burst at several places.
6. The so called air shaft is bent, perhaps because of the lateral pressure.

The King's chamber was built high up on 43.03 meters - other pyramids had chambers underground or positioned only a few meters above ground. For Khufu's pyramid the master builders had to deal with totally new problems.



Because several granite beams have burst or otherwise been damaged and the softer limestone around the chamber has been lowered by 15cm, some people think, that the stress-relieving chambers should be called "stress-creating" chambers [6]. But the fact, that the King's chamber hasn't yet collapsed shows, that the pyramid builders had found a solution that worked for thousands of years!

The Grand Gallery

The entrance used today to enter the pyramid is a breach underneath the original entrance to the pyramid. Nowadays you go directly to the Grand Gallery bypassing three large stones blocking the corridor.

The Grand Gallery is very impressive, it is 46.71m long, the roof is 8.74m high and the walls are made from granite. The roof forms a 26°-angle [2] and consists of seven corbels. With Franz Löhner's heavy duty track system you can transport the granite blocks you need here up to the appropriate height with no problems.

Transporting the large granite blocks up the pyramid

It is interesting, that the so called corbelled vault was "invented" at the same time as the larger pyramids were built. The first corbelled vault was built in the pyramid of Meidum, then Sneferu's pyramids and Khufu's pyramid followed [2]:

Pyramid of Meidum - corbelled vault spanning 2.65m, 5.05m high

Bent pyramid with 2 burial chambers, the first 4.96 by 6.3m and 17.3m high, the second 5.26 by 7.97m and 16.48m high

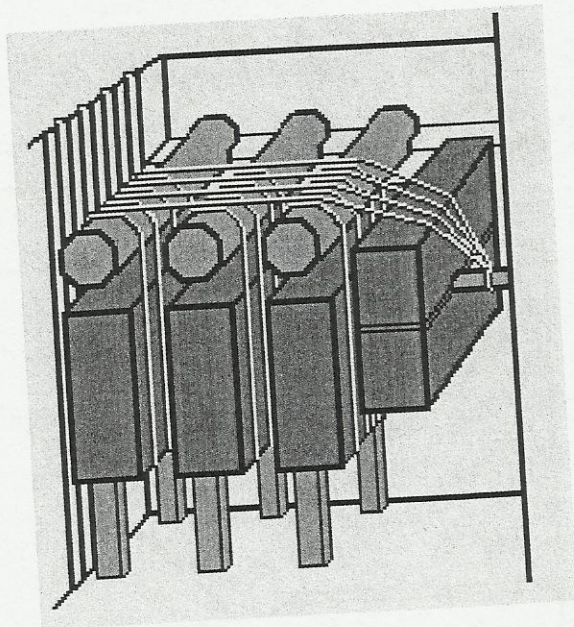
Red pyramid - corbelled vault of 4.18 by 8.35m and 14.67m high with 14-16 corbels

Khufu's pyramid (Grand Gallery) - corbelled vault 2.09m by 46.71m and 8.74m high

Why was this new building element employed? A corbelled vault is used, if the distance from one wall to the other is too large, so a piece of stone put flat can't overcome it. Interestingly this new building element abruptly appears and is executed right away on a very high level. Then, two generations later it is already not employed anymore (Khafre's pyramid only has gabled roofs, Menkaure's pyramid vaults).

Antechamber with Portcullis

Three granite stones were once suspended in the antechamber to the King's chamber. These so called portcullises were probably lowered after the funeral ceremonies and blocked the access to the tomb. Their purpose was to impede tomb raiders from entering. There were also 25 to 26 large blocks lowered into the Grand Gallery [1], blocking it completely. This system didn't help much - the robbers probably climbed over the lowered portcullises and chiseled off enough of the granite over the entrance to the burial chamber to be able to enter. Portcullises are also known from the Bent pyramid and from Khafre's pyramid.



The manner how those heavy portcullis slabs were suspended uses the same principle as Löhner's rope roll. Ropes were slung over a round longitudinal support (= roll) and then tied to a cross beam. The rope glided over the beams and the huge weights were moved, but there was no wheel or axle involved. The slabs were probably held in position by wooden supports [2]. The same principle was used to lower other portcullises and stone plugs into corridors and shafts - putlog holes for the wooden beams were found in several tombs. The round cross beams were resting on specially shaped stones, which had a semicircular cut on top. Franz Löhner thinks, that the tracks he suggests for the sledges were also anchored to the pyramid flank on similar looking Tura stones.

The Air Shafts

These shafts start from the King's chamber and the Queen's chamber upwards and to the north and south. The air shafts, which start in the King's chamber are better known. They are made from limestone, except where they cross the granite walls of the chamber. The exit of the northern shaft was enlarged by tomb robbers to a depth of 11m [5], and part of the shaft destroyed. The southern exit of the shaft to the surface of the pyramid was restored. It is not known, if the shafts were covered by the outer casing stones or not, because the stones are not there anymore. Both shafts are not straight, but slightly bent [5].

There are also 2 shafts originating from the Queen's chamber, but they were covered up originally. These "Air shafts" were discovered in 1872 by Wayman Dixon who put a piece of wire through one of the joints and realized, that the wall sounded hollow at two places. He then broke open the wall and discovered the shafts which have a diameter of 20 by 20cm.

In 1993 the engineer Rudolf Gantenbrink [5] sent a robot into the air shafts. After 66m he discovered a stone blocking the access to the rest of the shaft. In 2002 another robot (Pyramid Rover 2) was sent in again, this time with the cooperation of National Geographic and the blocking stone was drilled through. Behind it was a small empty space and a second blocking stone. If there is a third blocking stone or if anything else can be found in the shaft is not known.

Those shafts only exist in the pyramid of Khufu but are not known from other pyramids. This is probably the reason why speculations about the purpose of these shafts are banded about. The explanations go from "should have helped the Ba of the pharaoh to be able to enter and exit" [1] to some undefined logistic function or that they point to the Orion or to the Polar star.

If you discuss the function of these shafts you shouldn't forget, that at least two of the shafts were completely covered. So one thing is clear - they can't have been there to get fresh air into the tombs, for that they would have to be open on both sides.

The Pyramid of Khafre

Original Height: 143.5 m (470.79 ft)

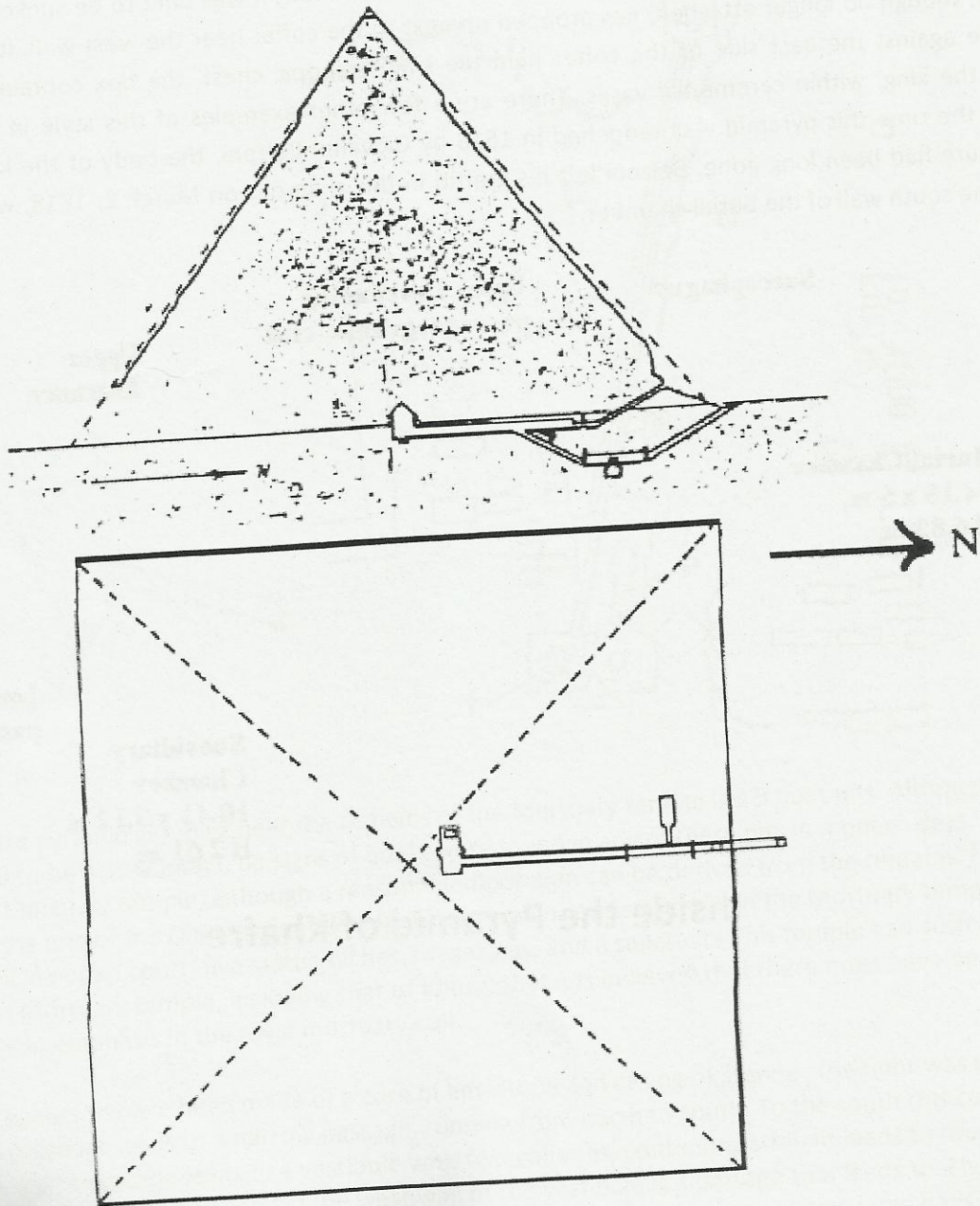
Current Height: 136.4 m (447.50 ft)

Length of Side: 215.25 (706.19 ft)

Angle: $53^{\circ} 10'$

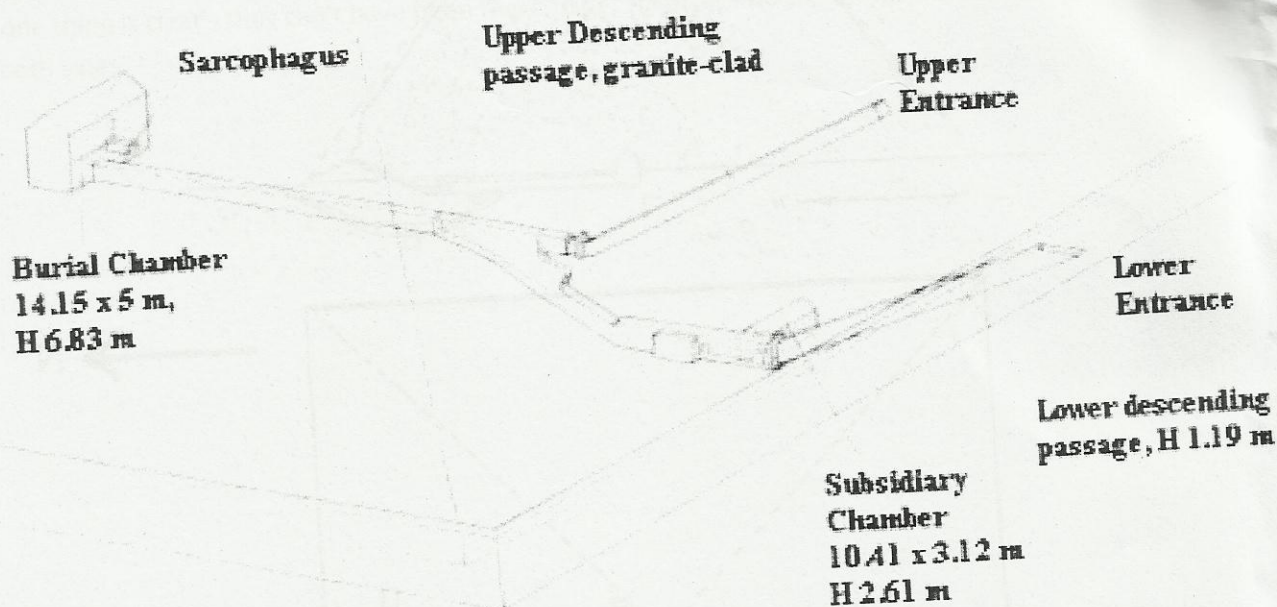
Estimated Volume: 1,659,200 cu m

Khafre was a son of Khufu and his is the second largest known pyramid in Egypt, only approximately 10 feet shorter than the Great Pyramid. Remnants of its original casing are still apparent at the top of the structure. After the accomplishment of the building of the Great Pyramid, King Khafre had a hard act to follow. Khafre rose to the occasion by building his pyramid on higher ground giving the illusion that his pyramid was taller. He also encased the lowest two courses in granite. The pyramid itself lacks the degree of precision that was present in the Great Pyramid. Its angle is slightly sharper and the four corners are not as well aligned to accurately meet the apex. Therefore it exhibits a slight twist at the top.



This pyramid contains 2 known chambers. One chamber is subterranean, carved into the very bedrock. The other has its floor carved into the bedrock while its upper walls and ceiling pierce into the base of the pyramid.

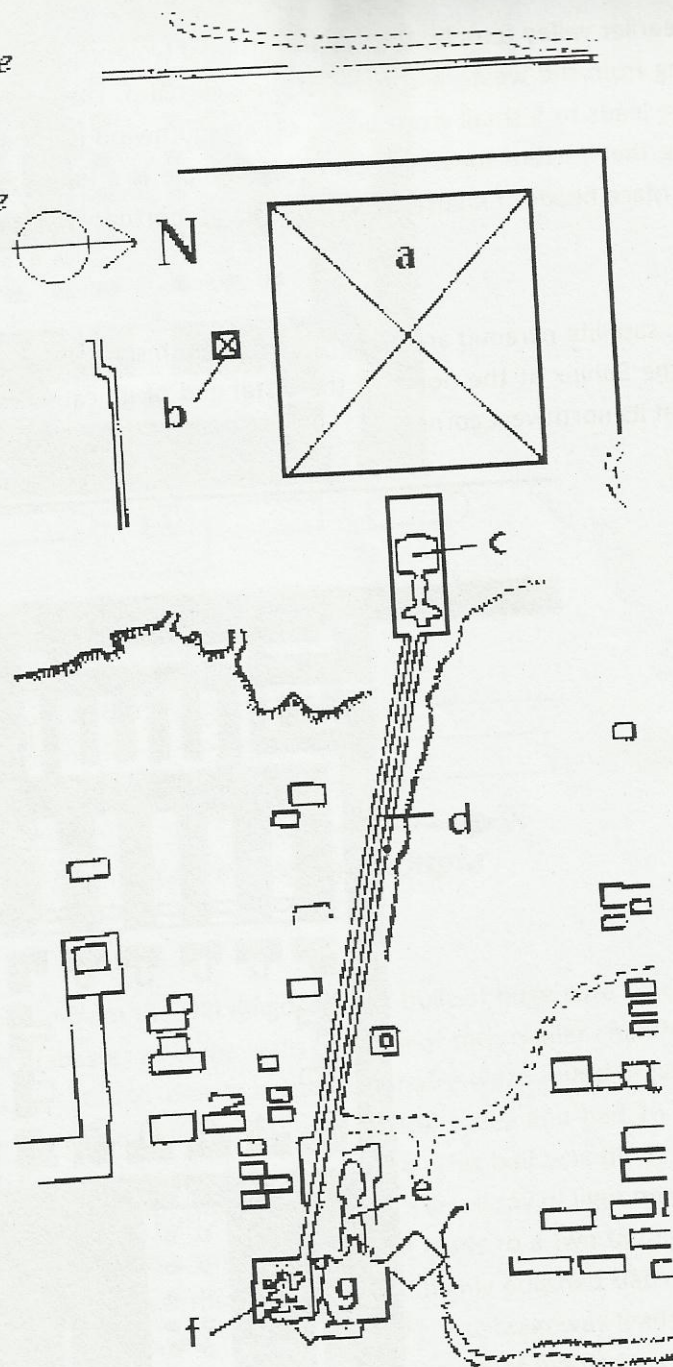
The higher entrance is 11.54m (38 ft) above ground level. The lower entrance begins at about ground level. As you enter the short descending passageway through the lower opening on the north side of the pyramid, you descend until the passageway levels off. Here we find a vertically operated portcullis. This level passageway is higher, almost across from the recess, is a short descending passageway leading to a chamber. This chamber which is carved in the plateau bedrock is 34' x 10'. It contains no sarcophagus and also includes a pointed ceiling. This chamber may have served for storage of offering material, treasure, or have been the equivalent of a serdab. Perhaps it is this pyramid's equivalent of the middle or so-called Queen's Chamber of the Great Pyramid, which also has a pointed ceiling. However, this room does not contain any niche in the wall for the life-size statue of the king, instead its east wall frames the entrance. As you exit this chamber and continue to the right, at the end of the passageway lies a ramp which ascends into the next passageway. Once you climb this ramp, if you turn around, you can also see the rough dressed granite lined passageway that leads back up to the higher entrance on the north side. There is a portcullis in at the interior end of this passageway as well. Continuing south down the passageway leads to the main burial chamber. On this higher level there is a chamber which is ft. 46.5 ft. long and 16.5 ft. wide. The ceiling also comes to a point. There is a unique black granite sarcophagus in this room in that it was built to be sunken into the floor. The original lid, though no longer attached, lies propped up next to the coffer near the west wall. It is possible that the open niche against the east side of the coffer held the king's canopic chest, the box containing the mummified organs of the king, within ceremonial vases. There are a few other examples of this style in other Old Kingdom tombs. By the time this pyramid was reopened in 1818 by Giovanni Belzoni, the body of the king and any sign of royal treasure had been long gone. Belzoni left his graffiti in this chamber on March 2, 1818, which is still present today on the south wall of the burial chamber.



Inside the Pyramid of Khafre

The Khafre Pyramid Complex

- a. Pyramid of Khafre
- b. Remains of satellite pyramid
- c. Mortuary Temple
- d. Causeway
- e. Sphinx
- f. Valley Temple
- g. Temple of the Sphinx



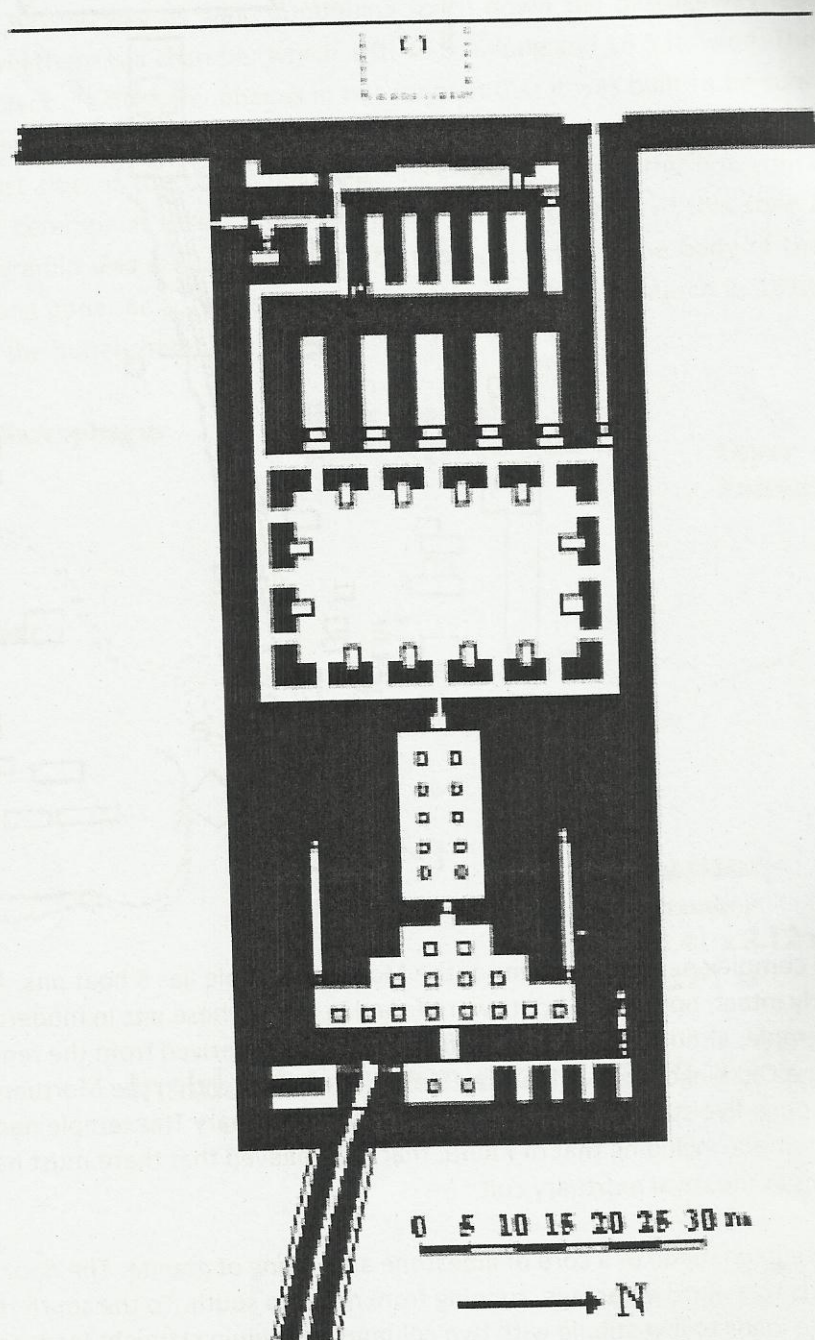
Within the Khafre pyramid complex near the remains of the Mortuary temple lies 5 boat pits. Although the roofs of two were found to be nearly intact, no signs of boats were found in any of these pits in modern days. Little also remains of the Mortuary temple, although a reasonable floor plan can be derived from the remains. From the time of Khafre until the end of the Old Kingdom, five features remain consistent within the Mortuary temple. These are: an entrance hall, an open court, five statue niches, magazines, and a sanctuary. This temple had such an expansion on any previous Mortuary temple, including that of Khufu, that it is believed that there must have been some religious change in emphasis in the royal mortuary cult.

This building appears to have been made of a core of limestone and casing of granite. The floor was made of alabaster. The entrance leads to a narrow passage, running from north to south. To the south this connects to two chambers. The north passage leads to a vestibule with two columns, continuing straight leads to four storerooms and a staircase which led to the roof. On the west wall of the vestibule is a passage that leads to a hall which contained 14 square columns. The north and south ends of this hall gives passage to two large bays. Beyond this hall

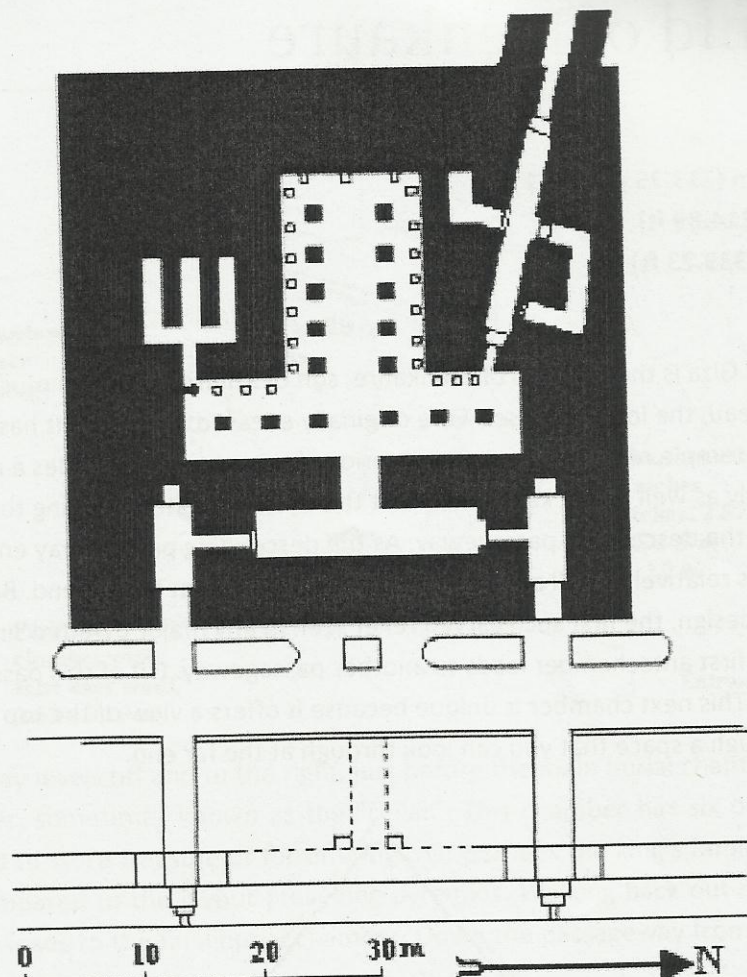
to the west was another hall which had 10 columns. Continuing to the west through this hall leads to the courtyard of the temple. Within this courtyard that there was a colonnade supported by rectangular pillars. Each of which also functioned as a back support for large statues of the king. It is on the western wall of this courtyard that we see a new feature emerge which then becomes standard in subsequent mortuary temples – five niches.

Only in one earlier valley temple, that of Sneferu, did we encounter a section with 6 niches. The passages flank the niches leading from the western corners of the courtyard. The north passage leads to the pyramid courtyard. The south passage leads to 5 small storerooms, Going southward is 2 more small rooms and a door leading outside the temple. Along the western most section of the temple is a long narrow sanctuary which has remnants of a large granite stela. Mace heads of Khafre were found in his mortuary temple

Remnants of a satellite pyramid are present on the south side of the pyramid. The complex is also unique because it incorporates the Sphinx at the north of the distal end of its causeway. The causeway connects to the rear of the valley temple at its northwest corner.



Plan of the Khafre Mortuary Temple



Plan of the Khafre Valley Temple

The Valley temple is one of the best preserved from the Old Kingdom. It is built of huge core blocks sheathed in red granite. The floor of the temple is made of alabaster as is the walls of some of the smaller chambers. There are two entrances on the eastern wall which flank a vestibule, diorite statues of Khafre were found in here. An entrance in the center of the western wall leads to a T-shaped hall which has 23 statue bases and had 16 square red granite pillars, which supported the roof. Many of these columns are still in place. This hall was dimly lit by small slotted window holes in the original ceiling, which were each positioned as to cast a small ray of light on each of the statues. At the southwest corner of the "T" of the hall there is a small passage that leads to a two tiered set of storerooms, three upon three. These have low ceilings and the lower rooms are made of highly polished slabs of red granite while the upper rooms are made of alabaster. At the northwest corner of the "T", a passageway leads back upward to an opening to the causeway. It is about halfway up this passage on the south wall that we find a small chamber that is lined and paved with alabaster. Across from the entrance to this chamber, on the north wall of that passage is a clockwise winding ascending ramp that leads upward to the roof of the temple. On the south side of the temple roof was a small courtyard which was located directly about the aforementioned 6 storerooms.

The Pyramid of Menkaure

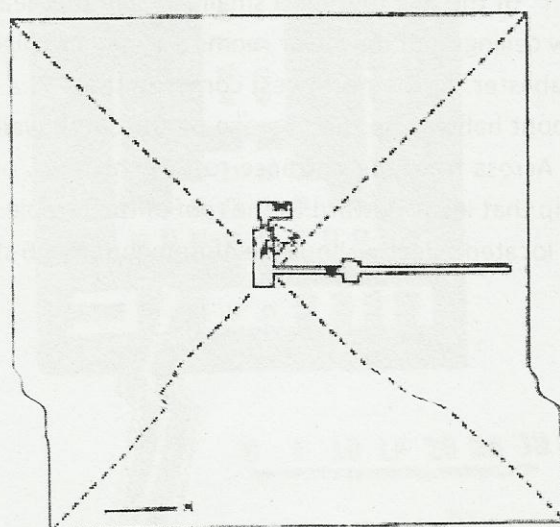
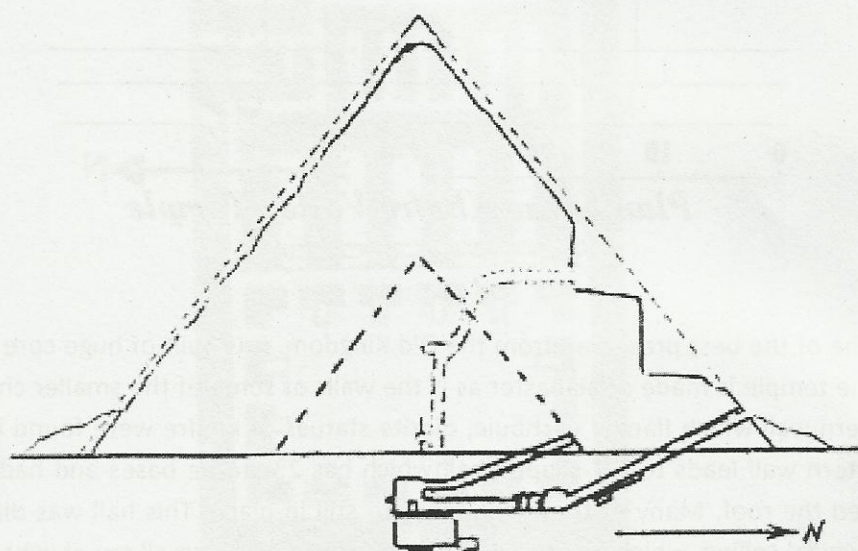
Original Height: 65 – 66 m (213.25 – 216.53 ft)

Current Height: 65.5 m (214.89 ft)

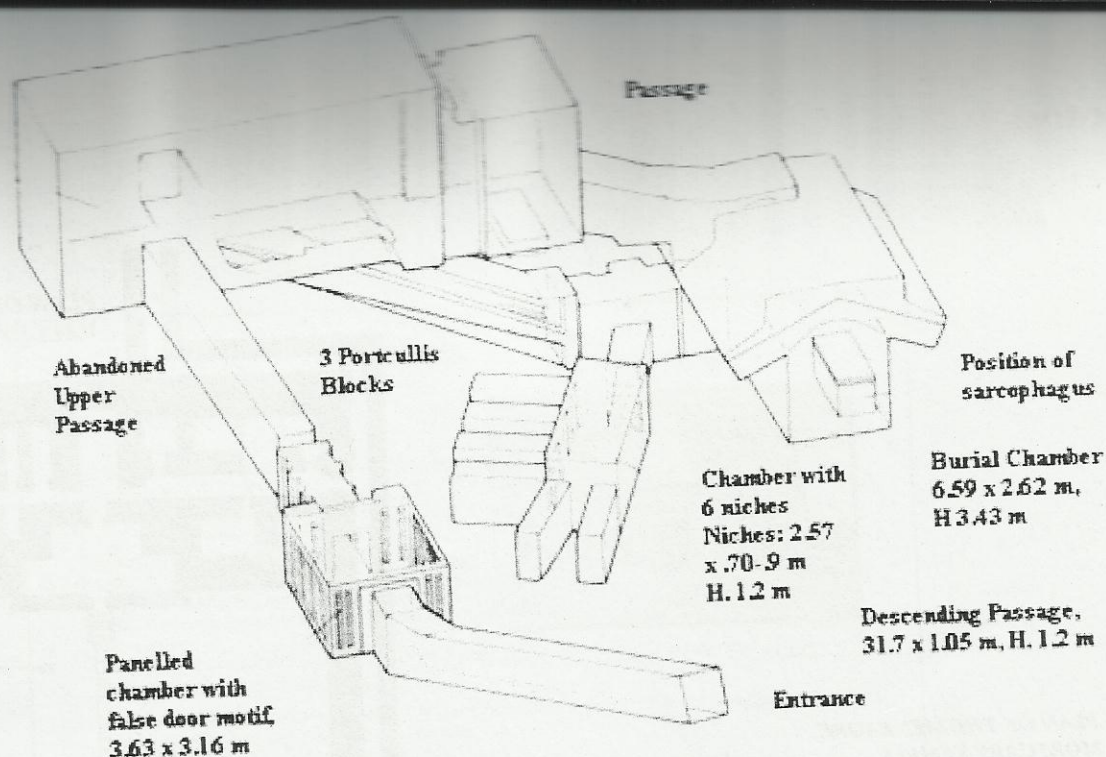
Length of Side: 103.4 m (339.23 ft)

Angle: $51^{\circ}20'$

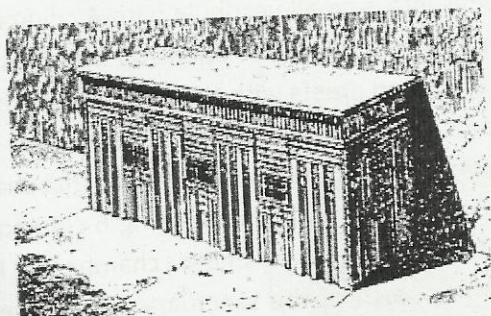
The last major pyramid of Giza is the Pyramid of Menkaure, son of Khafre. Although **much smaller** than the other two pyramids on the plateau, the lower courses were originally encased in granite. It **has three subsidiary pyramids** and some of its Mortuary temple remains intact. The interior of this pyramid includes a **room possibly** for the burial of some of the king's family as well as the king himself. At the end of the steps leading to the opening, there are a few steps downward into the descending passageway. As the descending passageway ends we enter into the first antechamber. This room is relatively small and there is another opening at the far end. Both openings are flanked by a carved "palace facade" design, the first such carved relief seen in any major pyramid since that of Zoser. The opening at the end of the first antechamber leads to another passageway. Off of this passageway is the opening into the next set of chambers. This next chamber is unique because it offers a view of the top of the vaulted ceiling of the main burial chamber through a space that you can look through at the far end.



Antechamber,
14.2 x 3.84 m,
H 4.87 m



This descending passageway levels off and to the right, just before the main burial chamber lies another passageway into a mysterious chamber, sometimes known as the "cellar". This chamber has six obvious niches within it. This room may have been used to store treasure or for offerings. Or perhaps the king's family was buried here, although this would be unusual compared to the layout preceding pyramids. Walking back out of this chamber and taking a right into the passageway leads to the final burial chamber. Down the passageway from the previous chamber leads to the main burial chamber.

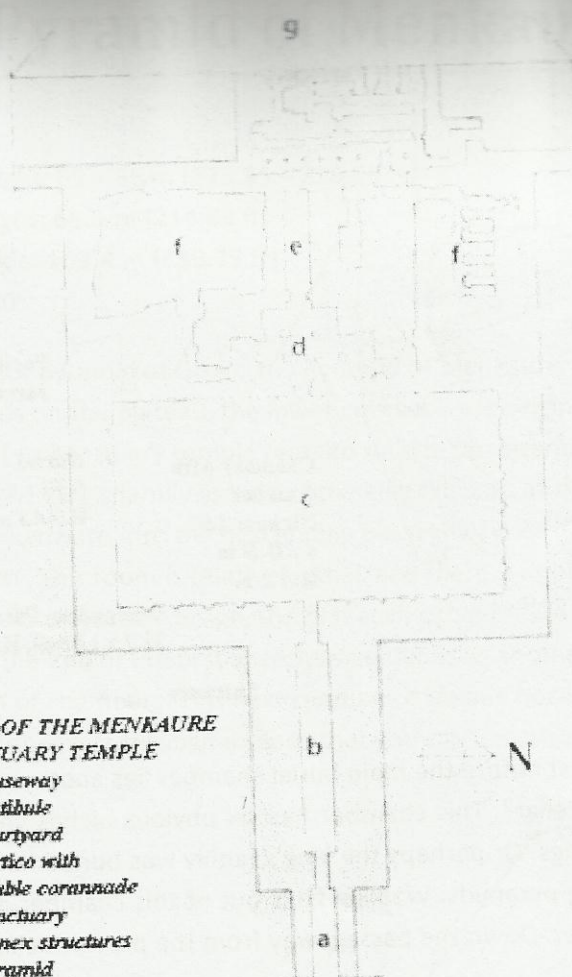


Menkaure Pyramid Complex

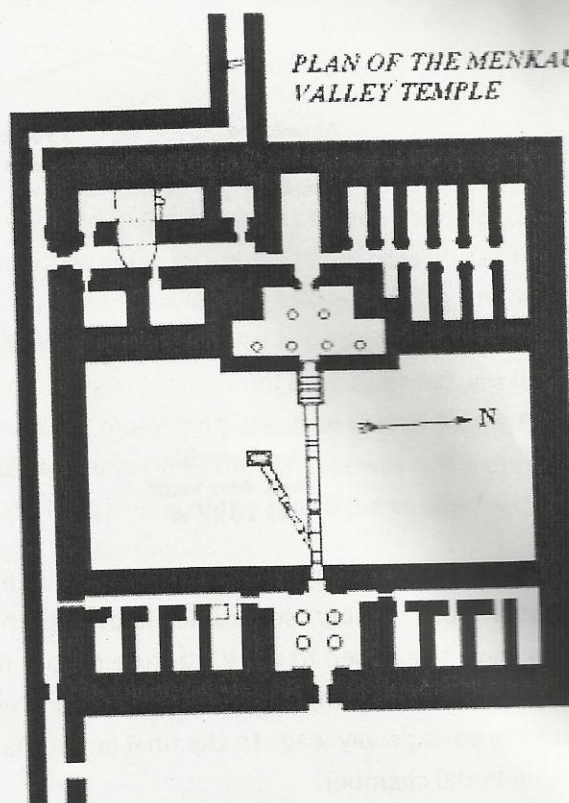
The mortuary temple of the Menkaure complex is the most intact mortuary temple on the Giza plateau. It is made of core limestone and was originally lined with granite in its interior. The entrance corridor was made of mudbrick and leads to a large courtyard. The courtyard was also cased with mudbrick, though with an outer layer of limestone. An interesting feature is that there is a basin and drainage system at the center of the courtyard. A recessed portico is located on the western wall of the court, this has 6 red granite columns. At the west end of this is a long narrow sanctuary. At the south end of the portico is a passage that leads to annex structures that do not appear to have been finished. From the north end of the portico a passage leads to 5 small rooms. At the westernmost end of the temple is an offering shrine which is built right against the face of the pyramid. This may have had a false door, and was paved with red granite. Just east of this is a corridor containing 6 limestone pillars, this was most likely built later during the 6th dynasty.

**PLAN OF THE MENKAURE
MORTUARY TEMPLE**

- a. Causeway
- b. Vestibule
- c. Courtyard
- d. Portico with
double colonnade
- e. Sanctuary
- f. Annex structures
- g. Pyramid



**PLAN OF THE MENKAURE
VALLEY TEMPLE**



The Valley Temple of Menkaure was built of mudbrick although there are signs of limestone structures seen in the pavement and column bases. It has an entrance on the east side that opens into a small vestibule with 4 columns supporting its roof. This vestibule is flanked by two sets of four storerooms. The southern set opens up into a long corridor that runs along the length of the temple, then takes a turn to the north and meets with the distal end of the causeway. At the west end of the vestibule a doorway leads to the courtyard. Through the center of the courtyard is a raised pavement made of limestone slabs. South of this lies a limestone basis with a drainage system that drains to under the pavement. The west end of the raised pavement ends at a pillared hall containing 6 columns which supported its roof. Beyond this hall was the sanctuary. To the south of the sanctuary are smaller chambers, it is within these that the famous triads statues of Menkaure were found. To the north of the sanctuary are another series of small chambers or magazines

Temples of Egypt

Components :

Walled open courts with colonnades along the main axis

Led to a covered shelter comprising of transverse columned vestibule (Hypostyle Hall)

sanctuary beyond

Axial gateway to court

The Gateway extended to the entire width of the court

Forming towering sloping sided pair of Pylons with a tall Portal - Pennon mast, gorge cornice roll moulded outer angles

Temple within enclosure and about it were houses of priests, Official buildings, stores, granaries and a sacred pool or lake

EXAMPLES

TEMPLE OF KHONS - KARNAK 1198 BC

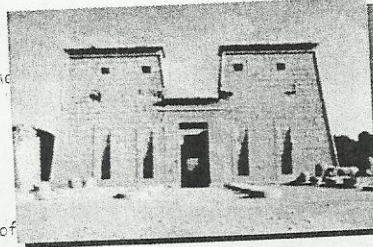
TEMPLE OF MENTUHETEP - DER EL BAHARI THEBES -2130-1580 BC M. KINGDOM

TEMPLE OF HATSHEPSUT - THEBES 1520 BC NEW KINGDOM

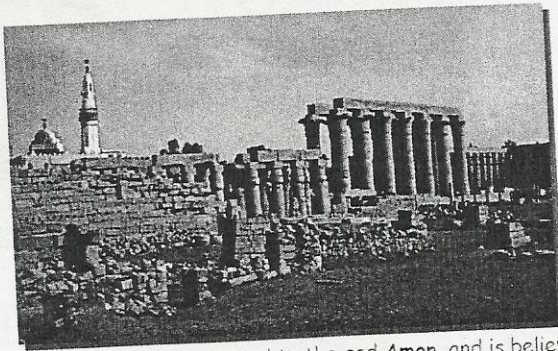
GREAT TEMPLE OF AMON - KARNAK 1530 - 323 BC NEW KINGDOM

TEMPLE OF LUXOR - THEBES 1408 - 1300 BC NEW KINGDOM

TEMPLE OF HORUS, MAMMISI TEMPLE EDFU - 237- 57 BC, HATHOR DENDERA 110BC-68AD



The Great Temple of Amon - Karnak 1530 – 323 BC



The temples of Luxor and Karnak are separated by about three kilometers with the sacred lake between them.

Karnak is divided into three areas separated by rough brick walls.

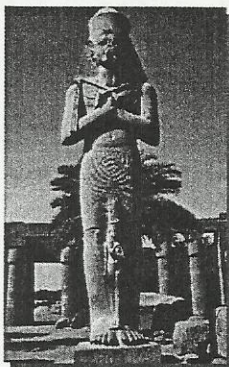
The largest area measures approximately 30 hectares

This temple, dedicated to the god Amon, and is believed to be the oldest of the four temples at Thebes.

To its left is the sanctuary of Manatee, the god of war

Across from it is the sanctuary to the goddess Mut, Amon's wife, who, interestingly enough, was symbolically represented as a vulture.

The Great Temple of Amon - Karnak 1530 – 323 BC



Colossus measuring 45 feet high representing a king with several cartouches

Grandest temple of all

Work of many kings

Originally consisted of a Shrine – 2000 BC

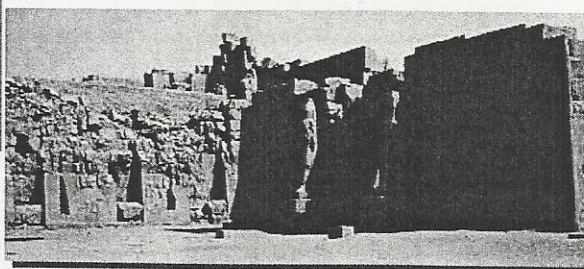
Enlarged by THOTMES I in 1530 BC

The size of the temple of Amon is amazing.

It is the largest temple supported by columns in the world.

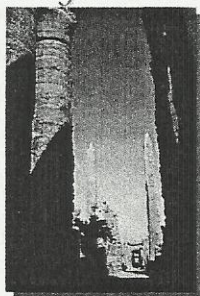
The temple was built by various pharaohs over a long period of time.

Amon-Ofis III built the twelve columns architraves, Ramses I began the decoration of this and it was continued by Seti I and Ramses the II.

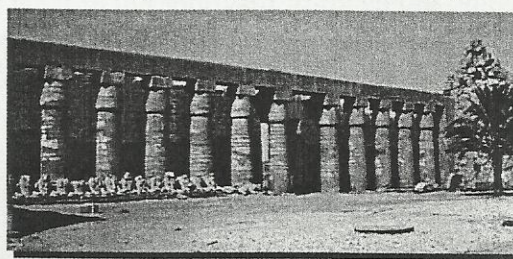


Entrance to the Temple

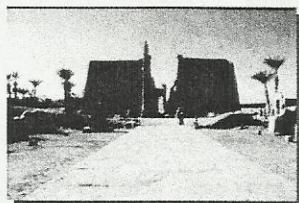
The Great Temple of Amon - Karnak 1530 – 323 BC



Two OBELISKS



The Great Courtyard of the TEMPLE OF AMON



• Site measures 366m x 110m

• Immense enclosure along with the other Temples and a Sacred Lake

• Surrounded by a Girdle Wall 6.1m to 9m thk.

• Connected by an avenue of sphinxes to Temple at Luxor

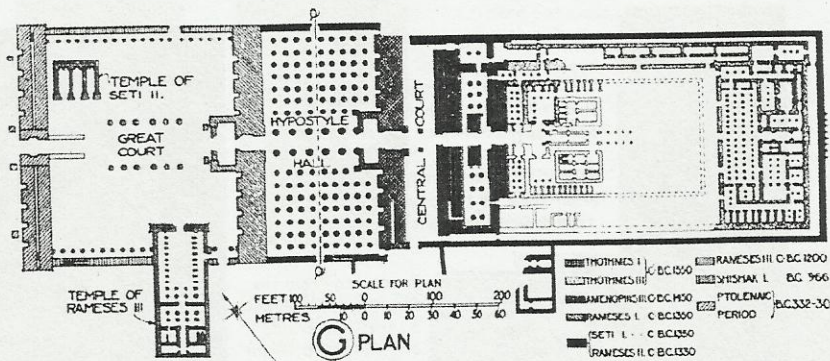
• 6 pairs of Pylons were added by successive rulers

• Consists of various courts and halls leading to Sanctuary

• Great court 103m x 84m acts as the entrance to the Vast Hypostyle Hall by SETI I and RAMESES II

• It measures 103m x 52m internally

The Great Temple of Amon - Karnak 1530 – 323 BC



The Great Temple of Amon - Karnak 1530 – 323 BC



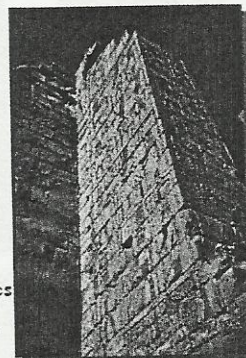
The most imposing structure is the **hypostyle hall**. Within its area stands **34 columns**, each almost **70 feet** high, with **open papyrus shaped capitals**.

Stones resting on top of these columns offer some of the best views of what the temple was like in ancient times.



Hieroglyphics on the temple wall

Protected from the **Sun** the **Hieroglyphics** on their underside are still the brilliant colors they were thousands of years ago.



Intricately carved PYLON

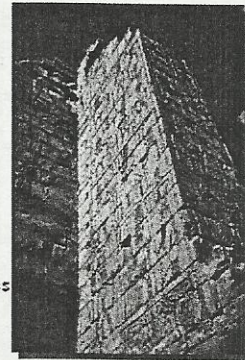
The Temple of Karnak was very elaborately carved with **Hieroglyphics** honoring many different gods

The Great Temple of Amon - Karnak 1530 – 323 BC



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The Great Temple of Amon - Karnak 1530 – 323 BC



There are a number of **obelisks** on the temple grounds.

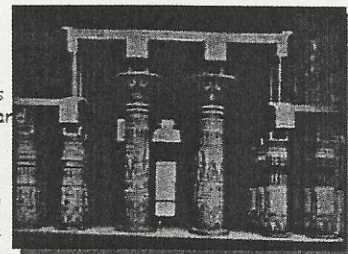
Only one remains from **Tutmosé I** and it measures almost **70 feet high** and is estimated to weigh **143 tons**.

Another, higher still, was erected by **Hatshepsut**, daughter of **Tutmosé I**



Inscriptions and reliefs cover the walls. **Column shafts and architraves** have themes on **Personages and God**

Inspiration for the coloured **Mosaics and frescoes**, stained **Glass** and mural statues in the Churches depicting the lives of **saints and heroes**



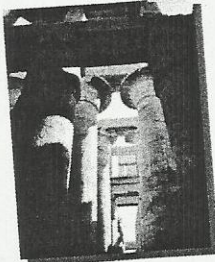
The Great Temple of Amon - Karnak 1530 - 323 BC



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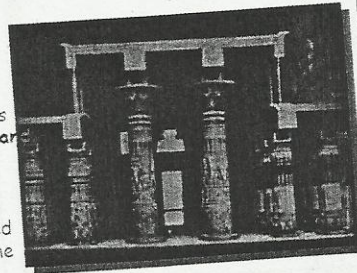
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The Great Temple of Amon - Karnak 1530 - 323 BC

